

REMARKS

Favorable reconsideration and allowance of the claims of the present application are respectfully requested.

Before addressing the specific grounds of rejection raised in the outstanding Office Action, Applicants have amended Claim 1 in the manner indicated supra. Specifically, Claim 1 has been amended to positively recite an overlying lower hardmask comprising a dielectric material. Support for the present amendment is found, for example, in paragraph [0035] of the instant application, which states that “[t]he lower hardmask 16 can be comprised of any suitable dielectric material, such as silicon nitride, silicon carbide, silicon oxycarbide, hydrogenated silicon carbide, silicon dioxide, organosilicate glass, and other low-k dielectric materials.”

Further, Applicants have added new Claim 20 to the instant application. New Claim 20 is supported by Claims 1, 2, 4 – 7, and 9 – 11 of the instant application.

Since the above amendments are supported by the specification, entry thereof is respectfully requested.

In the Office Action dated January 2, 2008, Claims 1, 2, 4 - 7, and 9 - 11 are pending.

Claims 1, 2, 4, 6, 10, and 11 stand rejected under 35 U.S.C. §102(e) as allegedly anticipated by U.S. Patent No. 6,846,756 B2 to Pan et al. (“Pan” hereafter). Claims 5, 7 and 9 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Pan.

Concerning the anticipation rejection, it is axiomatic that anticipation under § 102 requires that the prior art reference disclose each and every element of the claim to which it is applied. In re King, 801 F.2d, 1324, 1326, 231 USPQ 136, 138 (Fed. Cir. 1986). Thus, there must be no differences between the subject matter of the claim and the disclosure of the prior art reference. Stated another way, the reference must contain within its four corners adequate direction to practice the invention as claimed. The corollary of the rule is equally applicable:

Absence from the applied reference of any claimed element negates anticipation. Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571, 230 USPQ 81, 84 (Fed. Cir. 1986).

Applicants respectfully submit that the claimed structures, as currently amended, are not anticipated by Pan since the applied reference does not disclose the claimed features. Specifically, Pan does not disclose an organo-silicate glass (OSG) dielectric material having a plasma treated surface layer that provides improved adhesion to an overlying lower hardmask comprising a dielectric material, yet is substantially undamaged.

In the outstanding Office Action, Applicants note that the Examiner identified a refractory metal adhesion/barrier layer 34 (col. 9, lines 8 -13 in Pan) as a lower hardmask.

While such a refractory metal adhesion/barrier layer 34 (col. 9, lines 8 -13 in Pan) enhances adhesion between an OSG dielectric material, Applicants observe that refractory metal adhesion/barrier layer 34 is metallic by nature, or at the very least conductive. Applicants observe that the refractory metal adhesion/barrier layer 34 is present between an underlying conductive area 21B and a copper filling layer 36 (See FIG. 2D of Pan). If the refractory metal adhesion/barrier layer 34 was comprised of a dielectric layer, the interconnect structure in FIG. 2D of Pan would not function as an interconnect structure since there cannot be electrical conduction between the underlying conductive area 21B and the copper filling layer 36.

Further, the label of a “refractory metal adhesion/barrier layer 34” denotes that the refractory metal adhesion/barrier layer 34 comprises a refractory metal, which is metallic and conductive. Particularly, Applicants observe that Pan cites “a tantalum nitride layer” as an example of the refractory metal adhesion/barrier layer 34, which is known for its high conductivity in the art. Thus, the disclosure of Pan makes it clear that that refractory metal adhesion/barrier layer 34 comprises a conductive material.

In contrast, Claim 1 of the instant application, as currently amended, positively recites an overlying lower hardmask comprising a dielectric material. Dielectric materials are not conductive, and consequently, cannot be the same material as any material that may be employed as a refractory metal adhesion/barrier layer. Thus, the claimed structure of the present invention necessarily comprises a different material, i.e., a dielectric material, than the refractory metal adhesion/barrier layer employed in Pan, which is necessarily a conductive material.

The foregoing remarks clearly demonstrate that the applied reference does not teach each and every aspect of the claimed invention, as required by King and Kloster Speedsteel; therefore the claims of the present application are not anticipated by the disclosure of Pan. Applicants respectfully submit that the instant § 102 rejection has been obviated and withdrawal thereof is respectfully requested.

Concerning the obviousness rejection, Applicants respectfully submit that the structure of the present application, as recited in currently amended Claim 1 and the dependent claims therefrom, is not rendered obvious by the disclosure of Pan. Specifically, Pan does not teach or suggest an overlying lower hardmask comprising a dielectric material.

The remarks made under the anticipation rejection are incorporated herein by reference.

Since the refractory metal adhesion/barrier layer 34 employed in Pan is necessarily a conductive material, and the overlying lower hardmask comprising a dielectric material according to the present invention is necessarily a dielectric material, Pan cannot teach or suggest the structure of the present invention.

The § 103 rejection also fails because there is no motivation in the applied reference, either individually or in practicable combinations, which suggest modifying the disclosed structures to include the various elements, particularly, an overlying lower hardmask comprising

a dielectric material, as recited in the claims of the present invention. Applicants observe that replacement of the refractory metal adhesion/barrier layer 34 in Pan with any dielectric material would electrically disconnect the underlying conductive area 21B and the copper filling layer 36 (See FIG. 2D of Pan and accompanying paragraphs) and consequently, render the interconnect structure of Pan non-functional.

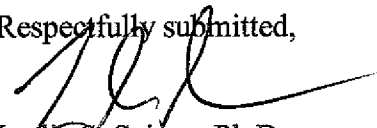
Thus, there is no motivation provided in the applied reference, or otherwise of record, to make the modification mentioned above. "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Vaeck, 947 F.2d, 488, 493, 20 USPQ 2d. 1438, 1442 (Fed.Cir. 1991).

Applicants respectfully submit that the rejection under 35 U.S.C. § 103 has been obviated; therefore reconsideration and withdrawal thereof is respectfully requested.

After reviewing the prior arts that the Examiner cited in the prior rejections, Applicants observe that the new Claims 20 is not disclosed, taught or suggested in the combinations of the prior arts under the rules allowed by MPEP. Applicants submit that the new Claim is patentable.

In view of the foregoing amendments and remarks, it is firmly believed that the subject application is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,



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